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PATENT COUNSEL
APPLIED MATERIALS, INC.
Legal Affairs Department
P.O. BOX 450A
Santa Clara, CA 95052

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| EXAMINER |
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MACARTHUR, SYLVIA

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/732,966
Filing Date: December 10, 2003
Appellant(s): CHEN ET AL.

David J. Goren
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed June 12, 2009 appealing from the Office action mailed September 12, 2008.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

| US Patent/Pub. Number | Inventor(s) | Publication Date |
|------------------------------|--------------------|-------------------------|
| 2005/0113002 | Chen et al | 05-2005 |
| 2003/0070757 | DeMeyer et al | 04-2003 |

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|-----------|--------------|---------|
| 6,419,567 | Glashauser | 07-2002 |
| 6,280,306 | Hosoki et al | 08-2001 |

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

*It is noted that the present invention and the prior art of Chen et al do not have a common inventor though the last name of the one inventor "Chen" are the same.

A. Claims 1-5, 7, 8, 13, and 18-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al (US 2005/0113002) in view of Hosoki et al (US 6,280,306).

Regarding claims 1, 19, and 22: Chen et al teaches a retaining ring (300) comprising: a generally annular body having a top surface, a bottom surface, an inner diameter surface, and an outer diameter surface, wherein the bottom surface includes a plurality of channels (grooves 304), see Figs. 3A-3F. Each channel extends from the inner diameter surface to the outer diameter surface and having a curved section defining a rounded ceiling and substantially vertical side walls, wherein a distance between the sidewalls is constant from the bottom surface to the curved section and the sidewalls have a length that is greater than the depth of the curved section. See depictions of carrier heads in Figs. 1B and 1C. See the Figures wherein the prior art

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Chen et al illustrates that the side walls have a length that is greater than the depth of the curved section and the vertical side walls extend to substantially the same depth as the ledge and that the height of at least one of the vertical sidewalls is substantially same as a height of the ledge, Figs. 3A-3F, 4A, and 4B.

Chen et al fails to teach a ledge as recited in the present invention.

The prior art of Hosoki et al teaches a wafer polishing apparatus with a retaining ring 27 with a ledge 27a that mates with a peripheral wall 24 having a ledge 30. The motivation to modify the retaining ring of Chen et al with a ledge is that it offers an alternative to mounting the retaining ring to the head body 22. According to col. 10 lines 29-38 this ensures that the diaphragm will avoid excessive forces.

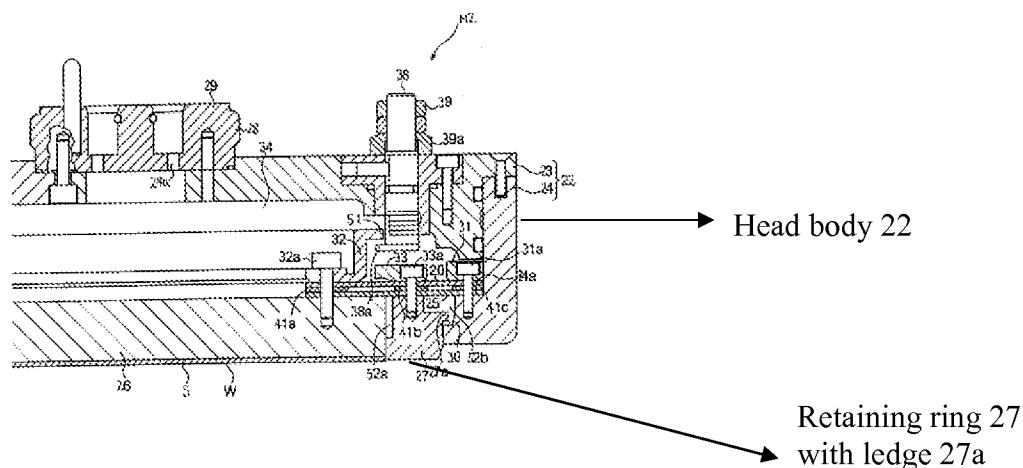


Figure 5 of Hosoki et al US 6,280,306 featuring ledge 27a (on retaining ring 27)

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Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide a ledge on the retaining ring of Chen et al as taught by Hosoki et al. Furthermore, the motivation to design the retaining ring wherein a height of at least one of the vertical side-walls is substantially the same as a height of the ledge so that the sidewalls will be flush with the ledge and decrease a change in force at the junction of ledge and side-walls, thus maintaining force of the ring and thus uniform support/treatment of the wafer. Furthermore, applicant recites on page 6 lines 18-23 that the reason for providing a ledge is to permit the retaining ring to mate with the carrier head. Without a showing of criticality of the dimensions of the retaining ring, it would have been obvious matter of design choice to provide a retaining ring of the optimal dimensions to provide optimal support and treatment of the wafer, See Ex parte Khusid, 174 USPQ 59 and In re Aller, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). Regarding claim 2: See Fig. 3B and [0062].

Regarding claim 3: Fig. 3 Depicts a semicircular cross-section has a diameter about equal to a width of the channel.

Regarding claims 4 and 5: See Fig. 3D-3F.

Regarding claims 7, 8, and 18: Uniform depth as depicted in the Fig. 2A.

Regarding claim 13: The annular body comprises a wearable material see [0058].

Regarding claim 20: Chen et al teaches a method of polishing wherein there is relative motion between a substrate and a polishing surface, see [004] to [006] substituting the retaining rings having grooves through which polishing fluid is supplied as illustrated in Figs. 3B-3F.

Regarding claim 21: Section [0067] teaches a depth of 1-30 mm or 0.04 –1.2 in.

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B. Claims 1-3, 7,8, 11, 13, 18-20, and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Glashauser (US 6,419,567) in view of Hosoki et al (US 6,280,306).

Regarding claims 1, 19, and 22: Glashauser teaches a retaining ring (300) comprising: a generally annular body having a top surface, a bottom surface, an inner diameter surface, and an outer diameter surface, wherein the bottom surface includes a plurality of channels (grooves 350), see Fig. 8F Each channel extends from the inner diameter surface to the outer diameter surface and having a curved section defining a rounded ceiling and substantially vertical side walls, wherein a distance between the sidewalls is constant from the bottom surface to the curved section and the sidewalls have a length that is greater than the depth of the curved section. See depictions of carrier heads in Fig. Fig.1A.

Glashauser fails to teach a ledge as recited in the present invention.

The prior art of Hosoki et al teaches a wafer polishing apparatus with a retaining ring 27 with a ledge 27a that mates with a peripheral wall 24 having a ledge 30. The motivation to modify the retaining ring of Glashauser with a ledge as suggested by Hosoki is that it offers an alternative to mounting the retaining ring to the head body 22. According to col. 10 lines 29-38 the ledge is for ease of mounting and also it ensures that the diaphragm will avoid excessive forces. See also the marked up copy of Figure 5 of Hosoki et al.

Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide a ledge on the retaining ring of Glashauser as taught by Hosoki et al. Furthermore, the motivation to design the retaining ring wherein a height of at least one of the vertical side-walls is substantially the same as a height of the ledge so that the sidewalls will be flush with the ledge and decrease a change in force at the junction of ledge and side-walls, thus

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maintaining force of the ring and thus uniform support/treatment of the wafer. Furthermore, without a showing of criticality of the dimensions of the retaining ring, it would have been obvious matter of design choice to provide a retaining ring of the optimal dimensions to provide optimal support and treatment of the wafer, See *Ex parte Khusid*, 174 USPQ 59 and *In re Aller*, 220 F. 2d 454, 456, 105 USPQ 233, 235 (CCPA 1955).

Regarding claim 2: See Fig. 8. and col. 6 lines 18-20.

Regarding claims 3 and 7: Fig. 8 depicts a semicircular cross-section has a diameter about equal to a width of the channel and have uniform depth.

Regarding claims 8 and 18: Uniform depth as depicted in the Fig.10.

Regarding claims 10-12: See 1A and 8 the difference in heights of the sidewalls creates a ledge.

Regarding claim 13: The annular body comprises a plastic or ceramic as recited in col. 5 lines 24-30. It is the examiner's position that the material of construction is wearable due to the movement of the ring along the substrate and the expressed to prevent damage to the wafer while pressing against the pad, see col. 3 lines 54-60.

Regarding claim 20: Glashauser teaches a method of polishing wherein there is relative motion between a substrate and a polishing surface, see col.3 substituting the retaining rings having grooves through which polishing fluid is supplied as illustrated in Figs. 1A and 8

C. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen et al in view of Hosoki et al or Glashauser in view of Hosoki.

The teachings of Chen et al or Glashauser or Hosoki et al were discussed above. Chen et al or Glashauser fail to teach the angle relative to the radial segment as recited in claim 8

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is between 30 and 60 degrees.

Regarding claim 9: Chen et al or Glashauser fails to teach the retaining ring of claim 8, wherein the angle is between 30 and 60 degrees.

The angle of orientation of the plurality of channels affects the uniformity and efficiency of flow of the slurry and serves to optimize the reduction of the accumulation of dried slurry in the grooves and thus reduces the micro scratches. It would have been obvious to one having ordinary skill in the art to have determined the optimum value of cause effective variables such as the angle of orientation of the channels in the absence of a showing of criticality, see *In re Woodruff*, 16 USPQ 2d 1934, 1936 (Fed. Cir. 1990). Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide the recesses of Chen et al or Glashauser at an angle range of 30 to 60 degrees in order to accommodate the force caused by polishing.

D. Claims 11, 14-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over (Glashauser or Chen et al) in view of Hosoki et al as applied above, and in further view of DeMeyer et al.

The teachings of (Glashauser or Chen et al) and Hosoki et al were discussed above.

Regarding claim 11: Both the combination of Glashauser et al or Chen et al with the prior art of Hosoki et al fail to teach the retaining ring of claim 10, wherein the outer diameter surface includes a first portion adjacent the bottom surface that has an outer diameter less than a second portion adjacent the top surface.

This occurs due to the ledge of DeMeyer et al. The motivation to provide a ledge is that

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the design ensures a threaded edge surface and an enhanced assembly of the retaining ring to the carrier of the CMP apparatus. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to provide a ledge in the retaining ring of Glashauser et al or Chen et al with the prior art of Hosoki et al when modified by the teachings of DeMeyer et al.

Regarding claim 14: Both combinations fail to teach the retaining ring of claim 1, wherein the annular body comprises an upper portion and a lower portion, the upper portion being more rigid than the lower portion.

DeMeyer et al teaches a two-part retaining ring wherein the upper part is metal and the lower part is made of plastic. The motivation to modify the apparatus of Glashauser et al as modified with the ledge of Hosoki et al into a two piece construction is that the wearable plastic portion of the ring can be replaced without removing the top portion from the carrier head see [007] of DeMeyer et al. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to construct the retaining ring of Glashauser or Chen et al with an upper portion and a lower portion and the ledge of Hosoki et al, the upper portion being more rigid than the lower portion as suggested by DeMeyer et al.

Regarding claim 15: The retaining ring of claim 14, recall the channels (grooves 350) of Glashauser are formed in the lower portion.

Regarding claim 16: Glashauser fails to teach the retaining ring of claim 15, wherein the lower portion is formed of a wearable material, only that the ring is made of plastic or ceramic in col.5 lines 24-28. Note the lower portion of DeMeyer et al is a wearable plastic. DeMeyer et al teaches a two-part retaining ring wherein the upper part is metal and the lower part is made of plastic. The motivation to modify the apparatus of Hiroshi into a two piece construction is that

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the wearable plastic portion of the ring can be replaced without removing the top portion from the carrier head see [007] of DeMeyer et al. Thus, it would have been obvious for one of ordinary skill in the art at the time of the claimed invention to construct the retaining ring of Hiroshi with an upper portion and a lower portion, the upper portion being more rigid than the lower portion as suggested by DeMeyer et al.

Regarding claim 17: The retaining ring of claim 15, further comprising a plurality of passages extending through the upper portion from the inner diameter surface to the outer diameter, see the channels of Glashauser, see Figs. 1A and 8.

(10) Response to Argument

Appellant argues on page 3 that the prior art of Chen and Hosoki both are silent regarding a height of a vertical sidewall with respect to a height of a ledge and that the examiner lacked a motivation to adjust the height as claimed in the invention. It is noted that Chen does not have a ledge as many conventional retaining ring. Thus, the teaching of the prior art of Hosoki namely the step portion 27a of the retaining ring 27 to provide a ledge to enhance the mounting of the retaining to the carrier head is relied upon. Regarding the design of the height of the ledge being the same as the height of at least one of the vertical sidewalls. this is interpreted as a matter of optimization that would be performed without undue experimentation at the time of the claimed invention. Note that the abstract of the prior art of Chen et al in the last sentence recites that the retaining ring with a curved portion of groove reduces the accumulation of dried slurry in the groove and thus reduces micro-scratches.

Modifying the retaining ring of Chen et al or Glashauser with the ledge of Hosoki et al and designing the resulting retaining ring to have the heights of the ledge and at least one of the

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vertical side walls as the same ensures that the flow of slurry through the channels of the ring of Chen et al would not be impeded and thus accumulated with the addition of the ledge.

The examiner noted appellant's arguments regarding the direction of forces on pages 4 and 5, but hopes that the marked up copy of Figure 5 of Hosoki has clarified how the retaining ring of Chen et al or Glashauser would be modified by the ledge of Hosoki et al.

It is further noted that appellant has been silent to the criticality of the height of the ledge relative to at least one of the vertical side-walls.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Sylvia R MacArthur/

Primary Examiner, Art Unit 1792

Conferees:

/Parviz Hassanzadeh/

Supervisory Patent Examiner, Art Unit 1792

/Christine Tierney/

Supervisory Patent Examiner, Art Unit 1700